

Graph completely. WARM UP  
State the Vertical and Horizontal Asymptotes, Domain, and Range

1.  $y = \frac{-3}{x+2}$  HA  $y = -2$  VA  $x = -2$

2.  $y = \frac{-2}{x-7}$  HA  $y = 0$  VA  $x = 7$

3.  $y = \frac{x+6}{x-4}$  HA  $y = 1$  VA  $x = 4$

4.  $y = \frac{8x+3}{2x-6}$  HA  $y = 4$  VA  $x = 3$

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### 8.4 Multiply and Divide Rational Expressions

**AVOID ERRORS**  
Do not divide out variable terms that are not factors.

ex 1  $\frac{x-5}{x-3} \neq \frac{-5}{-3}$  *if it's not a factor*  
 $\frac{x(x-5)}{x(x-3)} = \frac{x-5}{x-3}$   
 $\frac{x}{x} = 1$

ex 2  $\frac{x^2-3x-18}{x^2-2x-24} = \frac{(x-6)(x+3)}{(x-6)(x+4)} = \frac{x+3}{x+4}$

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### Factor and HACK!!!

**EXAMPLE 1** Simplify a rational expression

Simplify:  $\frac{x^2-2x-15}{x^2-9} = \frac{(x-5)(x+3)}{(x+3)(x-3)} = \frac{x-5}{x-3}$

DOMAIN restrictions are

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$\frac{3x^2-12}{5x-10} \cdot \frac{1}{2x+4}$

$\frac{3(x^2-4)}{5(x-2)} \cdot \frac{1}{2(x+2)}$

$\frac{3(x-2)(x+2)}{5(x-2)2(x+2)} = \frac{3}{10}$

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Dividing a fraction...is the same as...

$\frac{x-1}{x} \div \frac{x^2-1}{x^2}$  *multiplying by the reciprocal*

$\frac{x-1}{x} \cdot \frac{x^2}{(x-1)(x+1)} = \frac{x}{x+1}$

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$\frac{x^2-100}{4x^2} \cdot \frac{x^3-5x^2-50x}{x^4+10x^3} \div \frac{(x-10)^2}{5x}$   *$x(x^2-5x-50)$*

$\frac{(x-10)(x+10)}{4x^2} \cdot \frac{x(x-10)(x+5)}{x^3(x+10)} \cdot \frac{5x}{(x-10)(x-10)}$

$\frac{5x^2(x+5)}{4x^5} = \frac{5(x+5)}{4x^3}$

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Simplify the expression, if possible.

1.  $\frac{2(x+1)}{(x+1)(x+3)}$
2.  $\frac{40x+20}{10x+30}$
3.  $\frac{4}{x(x+2)}$
4.  $\frac{x+4}{x^2-16}$
5.  $\frac{x^2-2x-3}{x^2-x-6}$
6.  $\frac{2x^2+10x}{3x^2+16x+5}$

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Multiply the expressions. Simplify the result.

8.  $\frac{3x^5y^2}{8xy} \cdot \frac{6xy^2}{9x^3y}$
9.  $\frac{2x^2-10x}{x^2-25} \cdot \frac{x+3}{2x^2}$
10.  $\frac{x+5}{x^3-1} \cdot (x^2+x+1)$

8.  $\frac{\overset{1}{\cancel{3}}x^{\overset{5}{2}}\overset{2}{\cancel{y}}}{\underset{4}{\cancel{8}}x\overset{1}{\cancel{y}}}\overset{2}{\cancel{y}} = \frac{x^6y^4}{4x^4y^2}$  add exp when mult

$= \frac{x^2y^2}{4}$

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**EXAMPLE 6** Divide rational expressions

Divide:  $\frac{7x}{2x-10} \div \frac{x^2-6x}{x^2-11x+30} \cdot \frac{x(x-6)}{(x-5)(x-6)}$

$$\frac{7x}{2(x-5)} \cdot \frac{(x-5)(x-6)}{x(x-6)} = \frac{\cancel{7x}(\cancel{x-5})(\cancel{x-6})}{2(x-5)\cancel{x}(x-6)}$$

$\frac{7}{2}$

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$$\frac{5x^2-20}{25x^2} \div \frac{x^2+6x+8}{x^2+10x+24}$$

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